



Supplemental Remedial Investigation

**Volume 1: Text, Tables, Figures, and
Appendices A through D**

**BNSF Former Maintenance and Fueling
Facility
Skykomish, Washington**

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RETEC Project Number: BN050-04018-439

Prepared for:

**The Burlington Northern and Santa Fe Railway Company
2454 Occidental Avenue, Suite #1A
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July 16, 2002

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Executive Summary

On behalf of The Burlington Northern and Santa Fe Railway Company (BNSF), the RETEC Group, Inc. conducted a Supplemental Remedial Investigation (Supplemental RI) between November 2001 and February 2002 at the BNSF Former Maintenance and Fueling Facility in Skykomish, Washington. The area of investigation included the former maintenance and fueling facility and surrounding properties that might have been affected by releases from the facility (Figure 1-2). These investigations were conducted to assess the nature and extent of contaminants in site soil, groundwater, and sediment, and to fill any remaining data gaps identified from previous site investigations. The complete data set, collected over the past 9 years, now includes over 1,200 samples that have been collected and analyzed. This data will be used to develop and assess potential alternatives for cleanup.

The Remedial Investigation (RI) process was initiated in 1993 under an Agreed Order between BNSF and the Washington Department of Ecology (Ecology). This Supplemental RI Report, after undergoing public review and then approval by Ecology, completes the RI process. The purpose of the RI is to: (1) characterize the nature and extent of contamination resulting from present and former site activities and current site conditions, and (2) provide sufficient data to enable the preparation of a feasibility study. Data were collected during the initial RI (1993 to 1995) and subsequent results of pre-Supplemental RI investigations (1995 to 2001) are integrated with the Supplemental RI results in this Supplemental RI Report as a complete data set. Section 2 of this report, and the 1996 Draft RI Report, detail these earlier investigations. The more recent investigations are detailed in the body of this Supplemental RI Report.

Following are the specific Supplemental RI objectives (as defined in the Supplemental RI/FS Work Plan, RETEC, 2001a):

- 1) Assess impacts to the Skykomish River (other than those already addressed by the installation of the subsurface barrier wall and LNAPL recovery system);
- 2) Define the extent of oil (also known as light nonaqueous-phase liquid or LNAPL) at the water table;
- 3) Investigate the former Maloney Creek channel (where there have been anecdotal reports of “PCB oil” being spilled on the ground);
- 4) Define the nature and extent of contamination on the rail yard (which is a potential source area for off-site groundwater contamination);

- 5) Define the nature and extent of contamination in areas outside the rail yard, such as residential, commercial, and public property, and investigating concerns from the community about these areas.

To meet the above objectives, over 700 samples were collected and analyzed during the Supplemental RI. The Supplemental RI fieldwork included advancing 45 additional boreholes, installing 23 monitoring wells, collecting additional soil and groundwater samples from inside and outside the rail yard, and collecting sediment samples from eight additional locations along the former channel of Maloney Creek and in a drainage ditch at the western edge of the site. In July 2001, sediment samples were collected to assess the hydrocarbon seeps along the Skykomish River.

Samples collected during the Supplemental RI were analyzed for several contaminants: total petroleum hydrocarbons (TPH); metals (arsenic and lead); polychlorinated biphenyls (PCBs); dioxins; polycyclic aromatic hydrocarbons (PAH); benzene, toluene, ethylbenzene, and xylenes (BTEX); and extractable/volatile petroleum hydrocarbons (EPH/VPH). The resulting data were subject to a rigorous quality assurance (QA) process. Results of the Supplemental RI field collection activities and data analyses are summarized below.

Source Characterization

There are currently no actively operating sources of hazardous substances at the former maintenance and fueling facility. The primary sources of contaminants at the rail yard are from historical facility structures and operations, as described in the Draft RI (RETEC, 1996a). Previous soil and groundwater investigations have identified the following three distinct source areas (Figure 5-1):

- 1) Maintenance area;
- 2) Fueling area; and
- 3) Electrical substation and sandblasting area.

In addition to the confirmed historic operational sources listed above, the following potential sources were identified by Ecology or the community and were further investigated during the Supplemental RI fieldwork:

- 1) Used transformer oil used as a dust suppressant on roads;
- 2) An oil pipe extending from the 100,000-gallon oil tank to near the engine house;
- 3) A ditch from the steel oil trap to the former Maloney Creek channel;

- 4) Former Maloney Creek channel;
- 5) Residential yards; and
- 6) An intermittent seasonal creek/stream.

Results of the soil, groundwater, and sediment sampling, conducted during the Supplemental RI to investigate these potential sources, are described below (by environmental media: soil, groundwater and sediments), followed by a summary of the findings.

Physical Setting

The Skykomish River valley is filled with glaciofluvial sediments consisting mainly of poorly to moderately sorted sand, gravel, and cobbles. The base of these sediments is approximately 200 to 250 feet below ground surface (bgs). Immediately underlying the site is sand and gravel with discontinuous silt and clay lenses (RETEC, 2001b). The local geology can be broken up into the following three distinct units:

- 1) Upper topsoil and fill (1 to 2 feet thick);
- 2) Gravelly sand and sandy gravel (11 to 22 feet thick); and
- 3) Lower Silt (3 to 10.5 feet thick where penetrated).

The groundwater flow is generally from the southeast to the northwest (ThermoRetec, 1999b). The main contaminant of concern is LNAPL, which floats on or near the top of the water table. Downward migration of the LNAPL below the gravelly sand unit has not been observed and is not expected because the lower silt unit is less permeable than the sand and gravel unit and LNAPL floats at or near the surface of the groundwater table.

Groundwater generally recharges, or is in equilibrium with, the surface water of the Skykomish River. During very high river stages, it is possible that a temporary, localized reversal in flow occurs and groundwater is recharged by the river. The former Maloney Creek channel is recharged by groundwater.

Soil Investigation Results

A total of 660 soil samples were collected from the rail yard and surrounding areas at various depths during the Supplemental RI. The highest TPH concentrations are generally present at or near the water table (the “smear zone” where LNAPL floats on groundwater). Elevated TPH was also detected above the water table (in the “vadose zone”) at identified source areas on and off the rail yard, likely from surface hydrocarbon releases (including from asphalt) penetrating the vadose zone and leaving behind residual TPH. TPH was not observed more than a few feet below the sand and gravel unit and into the underlying silt layer.

During earlier investigations, arsenic and lead were identified as the primary metals of concern. Potential sources include coal-burning, leaded-fuel exhaust, sandblasting and painting activities, and local geology with naturally occurring elevated mineral content. Natural background concentrations (27.7 mg/kg for arsenic and 37.5 mg/kg for lead) were calculated using local data and Ecology's protocol. Arsenic impacts were limited to surface soils on the rail yard, primarily near the former unloader pits and maintenance buildings. Elevated lead concentrations mainly coincide with historic rail yard operations. Elevated lead concentrations appear to be randomly distributed in surface soil outside the railyard.

PCBs were detected on the rail yard prior to the Supplemental RI. No PCBs were detected in surface soil samples collected during the Supplemental RI, including samples collected from roads where oil may have been used as a dust suppressant. No PAHs (a component of petroleum) were detected outside the rail yard in surface soil samples. Benzo(a)pyrene (a carcinogenic PAH) was only detected in one vadose zone sample, MW-39 (0.13 mg/kg), a location also having elevated TPH concentrations. Most PAHs were found in the smear zone along with the highest concentrations of TPH. BTEX (another component of petroleum) was rarely detected in soil and not at significant concentrations.

Groundwater Investigation Results

Groundwater was sampled from 50 monitoring wells during the Supplemental RI. LNAPL has been found as a residue coating soil particles, and as free-phase product floating on the water table. Both free-phase product and residual product in the soil affect ground water quality. Residual product in the vadose zone was generally found in source areas on the rail yard and in the smear zone near areas of free-phase product. The Supplemental RI data show that free-phase LNAPL is present in several discontinuous plumes between the rail yard and the Skykomish River. The apparent thickness of the LNAPL averages approximately 6 inches. The free product is generally still present in the same wells where free product was observed in 1993 and 1994. During the Supplemental RI, TPH concentrations dissolved in groundwater ranged up to 2.6 mg/L and the TPH is comprised of diesel-range components. The distribution of PAHs and BTEX in groundwater is closely related to areas with LNAPL. PCBs were detected in only one groundwater sample (MW-32 in 1993). The well was recently resampled and no PCBs were found.

Wells were installed adjacent to the former Maloney Creek channel where elevated TPH concentrations were observed in sediments (described below). The results from the wells were inconclusive, but do suggest that contaminated groundwater may be affecting sediments in the former channel of Maloney Creek (Figure 8-3).

Sediment Investigation Results

Sediment samples were collected from 21 locations along the Skykomish riverbank and along the former Maloney Creek channel during the RI. TPH concentrations were generally highest in samples collected from the smear zone along the former channel of Maloney Creek and near a LNAPL seeps along the Skykomish River.

Metals concentrations in sediments were generally low; average concentrations of arsenic and lead were 9 and 20 mg/kg, respectively. No PCBs were detected in sediments by RETEC (Ecology detected PCBs in one sample). PAHs were detected in the smear zone near the former channel of Maloney Creek, where TPH concentrations were also elevated. One surface zone sediment sample (collected by Ecology) detected PAH. No BTEX was detected in any sediment sample.

Biological toxicity testing was completed using sediment samples collected along the Skykomish River in July 2001. The testing was designed to assess the effect of sediment quality on growth and mortality of biota, such as midge larva and amphipods. Significant biological effects were observed in sediments from SED-12 and SED-13, and a minor effect was observed at SED-14 (Figure 3-3). Downstream samples (located approximately 80 feet away) did not show adverse effects. The biological tests had good correlation between species sensitivity and observed response. In four freshwater tests, 100 percent mortality was observed when TPH concentrations exceeded 4,300 mg/kg.